

CHAPTER 4 Test (with a bit of chapter 3 review..)

REVIEW from CHAPTER 3:

- factoring completely a trinomial $ax^2 + bx + c$ ($a=1$) (might involve factoring out common factor first)
- simplifying a polynomial expression that might involve FOIL; might involve distributing the negative before the bracket..
- identifying numbers that are prime or not prime (knowing the definition would help you)

CHAPTER 4:

4.1 - knowing how to use your calculator:

- to find a root (like 8th root)
- to find the answer to a decimal with a fractional exponent

4.2 - identifying a number as integer, rational or irrational

- 4.3
- writing an entire radical as a mixed radical in simplest form (including large numbers - use prime factorization to find perfect square if needed)
 - writing a mixed radical as an entire radical
 - writing a set of numbers in order that involve radicals (including cube roots etc.), fractions
 - Given area of a square, find side length (write as mixed radical). Then find perimeter of square (as mixed radical).
 - Find the error in an answer simplifying an entire radical to mixed radical

- 4.4
- converting a term with a rational exponent to its radical equivalent
 - evaluate a term with a rational exponent - showing all steps
 - question like p. 226 example 4

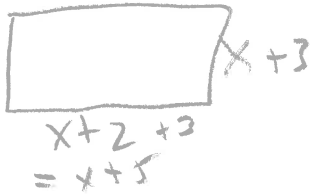
4.5 -simplifying a rational expression that has positive and negative exponents

- 4.6
- simplifying an expression to the power of a negative exponent
 - simplify an expression to the power of a rational exponent
 - simplify an expression that has rational exponents (using exponent laws) and then evaluate
 - simplify an expression with radicals, using exponent laws

Highlight the skills above that you think you need to work on more. If you would find this helpful to your test preparation, complete the following review. Answer key will be posted. Highlight the questions that you found difficult or didn't know how to do. That will give you an idea of what kinds of questions you need to work more on for the test. More practice questions can be found in your textbook.

Chapter 3 Review:

1. The ~~size~~^{length} of a rectangular table in a kitchen is 2 feet longer than the width, x . I want to get a new kitchen table that is 3 feet longer on each side. What is the equation of the new area of the kitchen table?



$$\begin{aligned} & (x+5)(x+3) \\ &= x^2 + 3x + 5x + 15 \\ &= x^2 + 8x + 15 \end{aligned}$$

2. Factor completely:

a) $a^2 - 7a - 30$

$$(a-10)(a+3)$$

b) $6a^2 - 11a - 10$

$$(2a-5)(3a+2)$$

c) $12a^2 - 27a - 9$

$$3(4a^2 - 9a - 3)$$

$$3(4a+3)(a-3)$$

d) $36x^2 - 49y^2$

$$(6x-7y)(6x+7y)$$

e) $-27x^2 + 12$

$$-3(9x^2 - 4)$$

$$-3(3x-2)(3x+2)$$

f) $-4xy^2 + 6x^2y^3 - 8x^2y^2$

$$-2xy^2(2 - 3xy + 4x)$$

g) $64x^2 - 32x + 4$

$$4(16x^2 - 8x + 1)$$

$$4(4x-1)^2$$

h) $12x^2 + 36x + 27$

$$3(4x^2 + 12x + 9)$$

$$3(2x+3)^2$$

3. Circle the prime numbers 0 1 2 3 4 5 6 7 8 9 10 11 12 13

4. Simplify completely:

a) $(2x + 3y)(3x - 5y)$

$$12x^2 - 10xy + 9xy - 15y^2$$

$$= 12x^2 - xy - 15y^2$$

b) $-(4x - 3)(5x + 2)$

$$-(20x^2 + 8x - 15x - 6)$$

$$= -(20x^2 - 7x - 6)$$

$$= -20x^2 + 7x + 6$$

c) $(x + 1)(3x - 2) - (4x + 1)$

$$= 3x^2 - 2x + 3x - 2 - 4x - 1$$

$$= 3x^2 - 3x - 3$$

d) $(x+2)(x-4)(2x+1)$

$$(x^2 - 4x + 2x - 8)(2x+1)$$

$$(x^2 - 2x - 8)(2x+1)$$

$$2x^3 - 4x^2 - 16x + x^2 - 2x - 8$$

$$= 2x^3 - 3x^2 - 18x - 8$$

3. Express the following mixed radicals as an entire radical:

$$\begin{aligned} \text{a) } -5\sqrt{3} &= \sqrt{(-5)^2 \cdot 3} \\ &= \sqrt{75} \end{aligned}$$

$$\begin{aligned} \text{b) } 3\sqrt[3]{4} &= \sqrt[3]{3^3 \cdot 4} \\ &= \sqrt[3]{108} \end{aligned}$$

$$\begin{aligned} \text{c) } 9\sqrt{15} &= \sqrt{9^2 \cdot 15} \\ &= \sqrt{1215} \end{aligned}$$

4.. A formula is $m = 27n^{\frac{2}{7}}$. If $n = 3.2$, substitute the value for n into the formula and solve.

round off to 2 decimal places

$$\begin{aligned} m &= 27(3.2)^{\frac{2}{7}} \\ m &= 37.64 \end{aligned}$$

5. Write the following using rational exponents.

$$\begin{aligned} \text{a) } 2\sqrt{5^3} &= 5^{\frac{3}{2}} \end{aligned}$$

$$\begin{aligned} \text{b) } \sqrt[4]{a} &= a^{\frac{1}{4}} \end{aligned}$$

~~$$a^{\frac{1}{4}}$$~~

6. Evaluate the following without a calculator. Show all the steps of your work.

$$\text{a) } (-3)^{-2}$$

$$\begin{aligned} &= \frac{1}{(-3)^2} \\ &= \frac{1}{9} \end{aligned}$$

$$\text{b) } \left(\frac{2}{3}\right)^{-3}$$

$$\begin{aligned} &= \left(\frac{3}{2}\right)^3 \\ &= \frac{27}{8} \end{aligned}$$

$$\text{c) } (64)^{-\frac{4}{3}}$$

$$\begin{aligned} &= \frac{1}{(\sqrt[3]{64})^4} \\ &= \frac{1}{4^4} \\ &= \frac{1}{256} \end{aligned}$$

$$\text{d) } (0.81)^{-\frac{2}{3}}$$

$$\begin{aligned} &= \left(\frac{81}{100}\right)^{-\frac{2}{3}} \\ &= \left(\frac{100}{81}\right)^{\frac{2}{3}} \\ &= \left(\sqrt[3]{\frac{100}{81}}\right)^2 \\ &= \left(\frac{10}{9}\right)^2 \\ &= \frac{100}{81} \end{aligned}$$

$$\text{e) } 16^{-0.75}$$

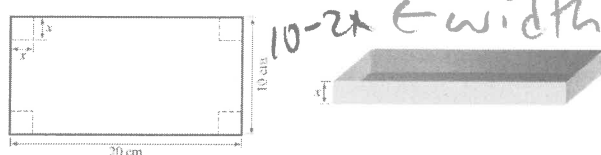
$$\begin{aligned} &= 16^{-\frac{3}{4}} \\ &= \frac{1}{(\sqrt[4]{16})^3} \\ &= \frac{1}{4^3} = \frac{1}{64} \end{aligned}$$

$$\text{f) } \left(-\frac{125}{64}\right)^{-\frac{2}{3}}$$

$$\begin{aligned} &= \left(-\frac{64}{125}\right)^{\frac{2}{3}} \\ &= \left(\sqrt[3]{-\frac{64}{125}}\right)^2 \\ &= \left(-\frac{4}{5}\right)^2 = \frac{16}{25} \end{aligned}$$

5. Write a polynomial to represent the length and width of the box (with the sides folded up).

A box with no lid is made by cutting four squares of side length x from each corner of a 10 cm by 20 cm rectangular sheet of metal.



$10-2x$ ← width
 $20-2x$ ↑ length

Chapter 4 Exponents and Radicals Review

1. Which Number System best represents the following numbers? Indicate only one of the following: Natural (N), Whole (W), Integer (Z), Rational (Q), Irrational (Q')

I. π Q'

IV. 0 W

II. $\frac{2}{3}$ Q

V. -5 Z

III. $\sqrt{36}$ N

VI. $5.\bar{6}$ Q

VII. 3.56274 Q

VII. $\sqrt[3]{5}$ Q'

2. Simplify the following expressions (Re-write in the **simplest**, radical form - mixed radical).
(Simplify using prime factors if you're not sure what the largest root is that is a factor.)

a) $\sqrt{200}$
 $= \sqrt{100 \cdot 2}$
 $= 10\sqrt{2}$

b) $\sqrt[3]{-81}$
 $= \sqrt[3]{-27 \cdot 3}$
 $= -3\sqrt[3]{3}$

c) $\sqrt[6]{3645}$
 $= \sqrt[6]{3^4 \cdot 5}$
 $= 3\sqrt[3]{5}$

d) $\sqrt[3]{3537}$
 $= \sqrt[3]{27 \cdot 129}$
 $= 3\sqrt[3]{129}$

7. Write the following in radical form *and* evaluate. Show your work

a) $125^{\frac{1}{3}}$ $= \sqrt[3]{125} = 5$

b) $0.09^{\frac{1}{2}}$ $= \sqrt{\frac{9}{100}} = \frac{3}{10} = 0.3$

c) $(-27)^{\frac{1}{3}}$ $= \sqrt[3]{-27} = -3$

d) $(\frac{16}{81})^{\frac{1}{4}}$ $= \sqrt[4]{\frac{16}{81}} = \frac{2}{3}$

e) $0.16^{\frac{3}{2}}$ $= (\sqrt{\frac{16}{100}})^3 = (\frac{4}{10})^3 = \frac{64}{1000} = 0.064$

f) $27^{\frac{4}{3}}$ $= (\sqrt[3]{27})^4 = 3^4 = 81$

g) $(-32)^{0.4}$ $= -32^{\frac{2}{5}} = -32^{\frac{2}{5}} = (\sqrt[5]{-32})^2 = (-2)^2 = 4$

h) $(-27)^{\frac{4}{3}}$ $= (\sqrt[3]{-27})^4 = (-3)^4 = 81$

8. Write the following radicals as a power.

a) $(\sqrt[4]{19})^3 = 19^{\frac{3}{4}}$

b) $\sqrt[3]{-6^5} = -6^{\frac{5}{3}}$

c) $\sqrt{\left(\frac{3}{4}\right)^9} = \left(\frac{3}{4}\right)^{\frac{9}{2}}$

d) $\sqrt{-1.6^2} = -1.6$

e) $(3x)^{-\frac{2}{3}}$ $= \frac{1}{(\sqrt[3]{3x})^2}$

f) $4x^{\frac{1}{3}}$ $= 4 \cdot \sqrt[3]{x}$

9. Write as radicals

e) $(3x)^{-\frac{2}{3}}$ $= \frac{1}{(\sqrt[3]{3x})^2}$

9. Evaluate the following, using your calculator. Round to 2 decimal places (if needed).

a) $\sqrt[4]{25} = 2.24$

b) $\frac{133}{7} = 19$

c) $1.5^{\frac{7}{4}} = 2.03$

10. Convert the following to *radical form*.

a) $11^{\frac{3}{2}} = (\sqrt{11})^3$

b) $z^{\frac{3}{4}}v^{\frac{5}{4}} = \sqrt[4]{z^3v^5}$

c) $a^{\frac{-3}{7}} = \frac{1}{(\sqrt[7]{a})^3}$

d) $c^{\frac{1}{3}}d^{\frac{-1}{3}} = \frac{\sqrt[3]{c}}{\sqrt[3]{d}} = \sqrt[3]{\frac{c}{d}}$

11. Simplify using exponent laws to write as a single power and then evaluate. *Round to 4 decimal places.*

$$(0.2)^3 \cdot (0.2)^{\frac{1}{3}} \cdot (0.2)^{\frac{1}{2}}$$

$$= 0.2^{\frac{18}{6} + \frac{2}{6} + \frac{3}{6}} = 0.2^{\frac{23}{6}} = 0.0021$$

12. Explain (in WORDS) your strategy (steps) for simplifying the following: $(\sqrt[6]{x^5})(\sqrt[7]{x^4})$

- ① Write each term with rational exponents (index = denom; power = numerator)
- ② Write fractional exponents as equivalent fractions with common denominator
- ③ Add fractions (add only numerators)

15. Use the exponent laws to simplify each expression. Leave final answer with positive exponents only.

a) $\left(n^{\frac{3}{5}}\right)(n^6)$
 $= n^{\frac{18}{5}}$

b) $\frac{y^{\frac{7}{4}}}{y^{\frac{3}{4}}}$
 $= y^{\frac{7}{4} - \frac{3}{4}}$
 $= y^1$
 $= y$

d) $(32p^8)^{\frac{1}{5}}$
 $= 32^{\frac{1}{5}} p^{\frac{8}{5}}$
 $= \sqrt[5]{32} p^{\frac{8}{5}}$
 $= 2p^{\frac{8}{5}}$

b) $(d^{-0.75})^5$
 $= d^{-3.75}$
 $= \frac{1}{d^{3.75}}$

f) $\left[\frac{(4y)^3}{x^{-2}y^4}\right]^{-2.5}$
 $= \left(\frac{64y^3}{x^{-2}y^4}\right)^{-\frac{5}{2}}$
 $= \left(\frac{64y^{-1}}{x^{-2}}\right)^{-\frac{5}{2}} = \left(\frac{x^2}{64y}\right)^{\frac{5}{2}} = \frac{x^5}{(\sqrt{64})^5 y^{\frac{5}{2}}} = \frac{x^5}{8^5 y^{\frac{5}{2}}} = \frac{x^5}{32768 y^{\frac{5}{2}}}$

g) $\left(\frac{2}{3}x^{-2}y^{-5}z^2\right)^{-3}$
 $= \left(\frac{3}{2}\right)^3 x^6 y^{15} z^{-6} = \frac{27 x^6 y^{15}}{8 z^6}$

16. A square has an area of 320 cm^2 .

a) What is the length of the side of the square in radical form? $\sqrt{320} \text{ cm}$

b) Write the length of the side as a mixed radical. $8\sqrt{5} \text{ cm}$

c) Find the PERIMETER of the SQUARE. Write the answer as a mixed radical. (Show work.)

Answer to c: $32\sqrt{5} \text{ cm}$
 $8\sqrt{5} + 8\sqrt{5} + 8\sqrt{5} + 8\sqrt{5}$
 $\text{or } 4(8\sqrt{5})$